IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit 1753	:	PATENT APPLICATION
Examiner R. McDonald	:	
In re application of	:	**METHOD AND APPARATUS FOR PREPARING SPECIMENS FOR MICROSCOPY**
FISCHIONE ET AL.	:	
Serial No.: 10/633,130	:	
Filed: August 1, 2003	:	

Pittsburgh, Pennsylvania 15222

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL APPEAL BRIEF

Applicants submit the following Appeal Brief in response to the Final Office Action of May 6, 2010 ("Office Action"), which finally rejected claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-135, 137-151 and 158-164 of the above-referenced application. Applicants timely filed a Notice of Appeal and a Pre-Appeal Brief Request for Review on August 5, 2010.

I. Real Party in Interest

The real party in interest is E.A. Fischione Instruments, Inc, which is a Pennsylvania corporation with a principal place of business at 9003 Corporate Circle, Export, PA 15632. E.A. Fischione Instruments, Inc. is the assignee of the above-referenced patent application.

II. Related Appeals and Interferences

There are no appeals or interferences related to this application.

III. Status of Claims

Claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-137 and 139-164 are currently pending in this application. Of the above claims, 152-157 have been withdrawn from consideration. Claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-135, 137, 139-151 and 158-164 stand rejected, claim 136 has been objected to, and claims 2, 8-15, 22, 23, 32-57, 66, 67, 70-72, 76-117, 119, 122, 123 and 138 have been cancelled. Therefore, 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-135, 137, 139-151 and 158-164 are being appealed.

IV. Status of Amendments

All amendments presented in the case have been entered.

V. Summary of the Claimed Subject Matter

A. Brief Summary

The present invention relates to an apparatus for preparing a specimen for electron microscopy. In order to be accurately viewed through the microscope, each specimen,

typically a 3mm disk, is prepared from a substrate material, cleaned, and then optionally prepared by treatment of the surface to aid imaging. In the prior art, these operations are conducted by separate pieces of equipment and the specimen is transferred therebetween. Transfer of the specimen in ambient air conditions permits recontamination of the specimen as well as an opportunity for physical damage. The instant invention was developed to provide a closed environment for all of the preparation steps to be accomplished under constant and controlled conditions. Optimally, the specimen is placed within a device under vacuum conditions which remain constant for all of the operations. Repeated creation and release of vacuum is both inefficient and potentially deleterious to the condition of the specimen. One significant challenge to accomplishing this combination under constant vacuum and within a single vacuum chamber is the potential interference of one process with the others within the device.

The processes which are included within the device and which are performed within a single vacuum chamber include plasma cleaning, ion beam and plasma etching and ion beam sputter coating. Plasma cleaning requires that a plasma generator be connected to the vacuum chamber for plasma cleaning the specimen, an ion source must be connected to the vacuum chamber for etching the specimen, and a plasma etching assembly must connected to the vacuum chamber for plasma etching the specimen. The coating is performed using ion beam sputter coating techniques where an ion beam is directed at a target formed of a conductive material. The apparatus may further include a source of process gas connected to the plasma tube which may include oxygen or oxygen mixed with a non-reactive gas such as argon.

An additional challenge in achieving the multi-step processing described above is the movement of the specimen through the successive stages (or stations) within the device. Many, if not all of the processing steps require the knowledge of the precise location and orientation of the sample so that accurate etching or coating thereof may be achieved. Recalling that the purpose of this preparation is for eventual imaging in an electron microscope, accuracy must be achieved to an extremely high level of precision. The claims therefore include, independently, a positioning device which is adapted to precisely locate and align the specimen in a three dimensional space. Each of the claims requires the use of a beam to locate an accurate, fixed position in *three dimensional space* from which all relative motion and displacement of the specimen may be calculated.

B. Direct Mapping of Independent Claim Elements to Specification

A direct mapping of the elements of the independent claims to the specification are as follows:

1. (Rejected) An apparatus for preparing a specimen for microscopy, comprising:

a plasma generator for plasma cleaning said specimen *(Page 17, lines 14-24; page 20, line 4 - page 23, line 4)*;

means for removing material from said specimen *(Page 24, line 10 - page 25, line 19)*;

means for coating said specimen with a conductive material *(Page 23, line 5 - page 24, line 9)*; and

means for plasma etching said specimen *(Page 24, line 10 - page 26, line 11; page 33, lines 5- 9)* which includes the selective spatial isolation of said means for plasma etching said specimen and said specimen from said plasma generator, said means for removing material and said means for coating said specimen when said means for plasma etching said specimen is operational *(Page 28, lines 11-18; page 34, line 22 - page 35, line 20)*;

wherein said plasma cleaning of said specimen and said coating of said specimen may be performed in a single process chamber under continuous vacuum conditions (*Page 33, line 22 - page 34, line 4 and generally throughout the specification).*

158. (Rejected) An apparatus for preparing a specimen for microscopy, comprising:

a processing chamber *(Page 17, lines 14-24; page 20, line 4 - page 23, line 4)*;

a sample stage, said sample stage being moveable to one or more processing positions inside said processing chamber, said processing position being defined by three dimensional coordinates *(Page 26, line 12 - page 27, line 8)*; and

means for detecting a first position of a surface of said specimen within said processing chamber *(Page 36, line 22 - page 37, line 18)*;

wherein said sample stage is moved automatically to said one or more processing positions remote from said first position in any of three dimensions and at an angle relative to a beam impinging thereon *(Page 36, line 5 - page 37, line 18 and*

generally throughout the specification).

161. (Rejected) An apparatus for preparing a specimen for microscopy, comprising:

a processing chamber *(Page 17, lines 14-24; page 20, line 4 - page 23, line 4)*;

a sample stage, said sample stage being moveable to one or more processing positions inside said processing chamber, said processing positions being defined by three dimensional coordinates *(Page 26, line 12 - page 27, line 8)*; and

a beam generating device and a beam sensor supported by said processing chamber, said beam generating device and said beam sensor being used to detect a first position of a surface of said specimen within said processing chamber *(Page 36, line 5 - page 37, line 18)*;

wherein said sample stage is moved automatically to said one or more processing positions remote from said first position in any of three dimensions and at an angle relative to said beam generating device *(Page 36, line 5 - page 37, line 18 and generally throughout the specification).*

VI. Grounds of Rejection to Be Reviewed on Appeal

Applicants present the following concise statement of each of the grounds of rejection presented for review:

A. Whether claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 121, 124-137 and 139-151 are indefinite under 35 U.S.C. § 112, first paragraph, for lack of written description.

B. Whether claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-137, 139-151 and 158-164 are obvious under 35 U.S.C. § 103(a) over various combinations of Siebert, U.S. Pat. No. 4,858,556, Moslehi, U.S. Pat. No. 6,051,113, Mahler, U.S. Pat. No. 4,595,483, Miyoshi, U.S. Pat. No. 6,325,857, Ameen, et al., U.S. Pat. No. 6,143,128, Chang, et al., U.S. Pat. No. 6,434,814, Mitro, et al., U.S. Pat. No. 5,922,179, Kobayashi, et al., U.S. Pat. No. 5,340,460, Holland, U.S. Pat. No. 5,311,725, Nomura, et al., U.S. Pat. No. 6,641,703, Chang, et al., U.S. Pat. No. 6,434,814, Hurwitt, U.S. Pat. No. 3,756,939, and Baldwin, et al., U.S. Pat. No. 6,419,802.

VII. Argument

A. Claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 121, 124-137 and 139-151 are not indefinite under 35 U.S.C. § 112, first paragraph, and are adequately supported by the written description in the specification.

The Examiner states that there is no support for the phrase "selective spatial isolation of said means for plasma etching said specimen and said specimen from said plasma generator, said means for removing material and said means for coating said specimen when said means for plasma etching said specimen is operational." Specifically, the Examiner inquires as to what element isolates the means for etching from each of the devices. *See Office Action dated May 6, 2010, page 2.* Applicant has previously drawn the Examiner's attention to portions of the specification which discloses several examples of the isolation of the etching means from each of the other devices. *See Applicant's response dated February 8, 2010, page 23.* For example, the specification generally describes moveable shutters or baffles positioned in front of

viewing window 200 and magnetron sputtering head 105 to "further protect from deposition of foreign material when not in use." *See Specification page 28, lines 11-12.*

More specifically, the specification states:

> "Moveable shutter 905 is provided within vacuum chamber 805 and is adapted to be moved, preferably automatically, to a position that covers aperture 900 when plasma cleaning is not being performed to protect the components of the plasma generator from contamination when the other specimen preparation processes described herein are being performed. Referring to Figure 11, when specimen 835 is to be plasma cleaned, sample stage 850 is moved, preferably automatically, to a position as shown in Figure 11 through operation of the appropriate stepper motors. In the position shown in Figure 11, specimen 835 is positioned adjacent aperture 900 and shutter 905 is moved to the open position."

Specification, page 39, line 17 - page 40, line 3. Additionally:

> "[m]oveable shutter 945 is provided in vacuum chamber 805 and is adapted to be moved, preferably automatically, to a position that covers aperture 940 when plasma etching is not being performed to protect the components of RIE assembly 920 from contamination when the other specimen preparation processes described herein are being performed."

Specification, page 41, line 21 - page 42, line 2 and see Figure 11.

Figure 1 also shows a transfer rod 30 which accommodates one or more sub-mounted specimens 3. Transfer rod 30 moves back and forth between *two separate* chambers-plasma chamber 15 and etching and coating chamber 20. *See Specification page 18, line 21 to page 19, line 1.*

Figure 6 illustrates an apparatus including two vacuum vessels 610 and 620. The port for specimen introduction and removal, the plasma generator and RIE electrode are located in vessel 610, while the ion gun and sputter target are located in vessel 620. The two vessels are joined by a shared valve 630, which serves to *isolate* and/or connect the two vessels. *See Specification page 34, lines 5-15.* The specification also describes an

additional embodiment where the valve 630 is replaced by a moveable baffle that, when closed, blocks the line-of-sight travel between vessels 610 and 620.

Applicant respectfully asserts that specification provides sufficient description of the portion of the claimed apparatus responsible for isolating the means for etching from the other devices. The claims therefore satisfy the written description requirement of 35 U.S.C. § 112, first paragraph.

B. Claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-137, 139-151 and 158-164 are not obvious under 35 U.S.C. § 103(a) over various combinations of Siebert, U.S. Pat. No. 4,858,556, Moslehi, U.S. Pat. No. 6,051,113, Mahler, U.S. Pat. No. 4,595,483, Miyoshi, U.S. Pat. No. 6,325,857, Ameen, et al., U.S. Pat. No. 6,143,128, Chang, et al., U.S. Pat. No. 6,434,814, Mitro, et al., U.S. Pat. No. 5,922,179, Kobayashi, et al., U.S. Pat. No. 5,340,460, Holland, U.S. Pat. No. 5,311,725, Nomura, et al., U.S. Pat. No. 6,641,703, Chang, et al., U.S. Pat. No. 6,434,814, Hurwitt, U.S. Pat. No. 3,756,939, and Baldwin, et al., U.S. Pat. No. 6,419,802.

1. Claim 1

The Examiner's primary argument against patentability of Claim 1 and its dependencies combines Siebert, Moslehi, Mahler and Myoshi. More specifically, Siebert is cited for teaching a means of removal of material and means for coating the specimen in a single process chamber. Reference is further made to an incidental statement of Siebert which states that other energy sources may be utilized in the apparatus. The Examiner admits that Siebert does not teach the inclusion of plasma cleaning, plasma etching, coating the specimen with conductive material or the selective isolation of portions of the device while plasma etching is in operation. The Examiner then cites Moslehi for plasma cleaning and coating. Mahler is cited for teaching coating the

specimen and plasma etching under continuous vacuum conditions. Miyoshi is cited for teaching the use of a shutter to isolate an etching means. The Examiner concludes by stating that it would be obvious to combine all of these references because Siebert "allows for performing process [sic] in a single chamber and protecting the other means from the etching device."

The claimed invention requires that the plasma etching functionality be ***isolated*** from the other component functionalities of the device ***when said means for plasma etching said specimen is operational***. As explained previously, this spatial limitation requires that the highly corrosive etching hardware be separated physically from the other functional devices. Applicant continues to contend that this is not taught nor suggested in the prior art. The Siebert reference does identify a shutter which rotates to expose the specimen to the appropriate operative hardware, and which is stated to provide additional substrate protection. However, no further disclosure is made and Fig. 7 merely identifies it as a standalone, line of sight shield between the various operative hardware and the specimen. Moreover, the testing or detection devices of the Siebert reference are still contained within the chamber with the specimen. The shutter is not shown to spatially separate the specimen and plasma etching mechanism from the other operative components. The Examiner relies on a single, nonspecific reference to other devices, "the sources 18 may be any of a number of different types of sources. . ." (col. 12, lines 24-25) as the basis for linking ***two or three*** additional references to arguably find all of the elements of the claimed invention.

KSR International Co. v. Teleflex Inc., 550 U.S. 398, 127 S.Ct. 1727, 167 L.Ed.2d 705 (2007) disposes of the heretofore enunciated standard requiring a teaching,

suggestion or motivation to combine references, in order to avoid improper hindsight reconstruction. *Id.* at 1742. The TSM standard has not been completely disavowed, however. A flexible TSM standard has been approved by the United States Court of Appeals for the Federal Circuit, following the KSR ruling.

> [T]he Supreme Court advised that 'common sense' would extend the use of customary knowledge in the obviousness equation: 'A person of ordinary skill is also a person of ordinary creativity, not an automaton.' *Id.* Thus, the Supreme Court set aside any 'rigid' application of the TSM test and ensured use of customary knowledge as an ingredient in that equation. The Supreme Court observed that this court had also 'elaborated a broader conception of the TSM test than was applied in [KSR]. *Id.* at 1743. Specifically the Court referred to *DyStar Textilfarben GmbH & Co. v. C.H. Patrick Co.*, wherein this court noted: '[o]ur suggestion test is in actuality quite flexible and not only permits, but requires, consideration of common knowledge and common sense.' 464 F.3d 1356, 1367 (Fed.Cir.2006) (emphasis original). The Court suggested that this formulation would be more consistent with the Supreme Court's restatement of the TSM test. *KSR Int'l Co.,* 127 S.Ct. at 1739. In any event, as the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention, see, e.g., *In re Rouffet,* 149 F.3d 1350, 1357 (Fed.Cir.1998), without unduly constraining the breadth of knowledge available to one of ordinary skill in the art during the obviousness analysis.

In re Translogic Technology, Inc., 504 F.3d 1249, 1260 (Fed.Cir. 2007). Pre-TSM courts utilize standards which are entirely consistent with this formulation. *In re Fine,* 837 F.2d 1071, 1073-75 (Fed.Cir. 1988), states:

> To reach a proper conclusion under § 103, the decisionmaker must step backward in time and into the shoes worn by [a person having ordinary skill in the art] when the invention was unknown and just before it was made. In light of all the evidence, the decisionmaker must then determine whether ... the claimed invention as a whole would have been obvious at that time to that person. The answer to that question partakes more of the nature of law than of fact, for it is an ultimate conclusion based on a foundation formed of all the probative facts . . . It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references . . . It is essential that 'the decisionmaker forget what he or she has been

> taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art.' One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention (citations omitted).

In this case, as in *Ortho-McNeil Pharmaceutical, Inc. v. Mylan Laboratories, Inc.*, 520 F.3d 1358 (Fed.Cir. 2008), the references amply support a finding of nonobviousness. "The challenges of this inventive process would have prevented one of ordinary skill in this art from traversing the multiple obstacles to easily produce the invention in light of the evidence available at the time of invention." *Id.* at 1365. Siebert merely discloses the potential use of other sources. It contains no further disclosure, nor any separation therebetween. Figure 2 identifies the different sputter and ion beam sources as all interchangeable above a rotating shutter. The shutter itself is merely a movable shade to temporarily block the emissions of the source from the specimen. Miyoshi discloses a chamber which is utilized to prepare a reactive material for exposure to the specimen. The chamber is sealed by a movable shutter. The shutter is closed to allow the reactant materials to enter the chamber in a controlled environment. When the reaction has produced the appropriate products, **the shutter is opened and the specimen is exposed to the material. The shutter is therefore utilized to** encapsulate the reactive materials, not shield the specimen or other fixtures in the chamber. Contrary to the Examiners assertions, the shutter of Miyoshi *would not* function to isolate one means from another so that the different processes do not affect the functionalities of the other components. In the most recent office action, the Examiner has stated, on Page 8, "[r]egarding isolating the etching means form[sic] the other means (claim 1), Miyoshi teach[sic] a shutter which isolates [sic] means from an etching means" (referring to

column 9, lines 62-68 and column 10, lines 1-4. This specific reference to Miyoshi teaches that the shutter is utilized to shield the catalyzer holder 2 (the source) from the operation of the cleaning device 5. ***The shutter 4 is utilized to shield the catalyzer (source) from the operation of the cleaner which is utilized to clean the interior of the chamber and specimen stage when the device is not in operational use to perform any etching, cleaning or coating of a specimen***. Neither Siebert nor Miyoshi teaches or suggests that a shutter may be utilized to shield different reactive components or fixtures during the use of other source components within a closed vacuum chamber during the operation of a source on the specimen. This is not a case where one element has merely been substituted for another.

A rote combination of the teachings of Siebert, Moslehi, Mahler and Miyoshi would not result in the claimed invention. The combination yields more than a predictable result, as required by *United States v. Adams,* 383 U.S. 39, 50-51 (1966), cited with approval by *KSR.* The claimed invention combines the heretofore disparate functionalities of plasma cleaning, etching with plasma and otherwise, and coating are all performed in the same chamber under continuous vacuum. This is especially true of plasma etching, which does not readily combine with other processes. None of these references recognizes the need to isolate the plasma etching function during operational etching of the specimen with particularity, nor do they recognize any need for separation of the functions. To stuff all of the identified features in a box does not yield a useful device. Even placing the Miyoshi reaction chamber into a common vacuum chamber would not yield the claimed device, as the device segregates the plasma etching function

while operational with respect to the substrate, and not as a preparatory or ***maintenance*** step.

As stated by the Examiner, some hindsight is necessary in any obviousness evaluation. However, the MPEP clearly states:

> Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the 'differences,' conduct the search and evaluate the 'subject matter as a whole' of the invention. The tendency to resort to 'hindsight' based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

MPEP §2142. Applicant respectfully reasserts that the Examiner is applying impermissible hindsight in the evaluation of the above-cited prior art references. None of the prior art references, either alone or in combination, teaches or suggests a shutter or other selective spatial isolation to shield different reactive components or fixtures during the use of other source components during the operation of a source on the specimen. Withdrawal of the rejection is respectfully requested.

2. Claims 158, 161

The Examiner has rejected claims 158, 161 and their dependencies based upon the teachings of Moslehi. More specifically, the Examiner states that Moslehi teaches a position sensor for detecting a position of the specimen, and that the sample stage can be moved to one or more processing positions remote from the first position in any of the three dimensions. The Examiner admits that Moslehi does not teach the use of a beam

impinging upon the sample stage to make such detection, nor does Moslehi teach the ability to hold the specimen at an angle to such a beam. The Examiner relies upon Mitro for the teaching of rocking the specimen in combination with Moslehi to reject the claimed requirement of holding the substrate at an angle. Baldwin is cited for the utilization of a beam to detect position.

Referring first to Moslehi, the reference discloses an indexing chuck which incorporates a stepper motor for positional reference. Each stepper motor has a preset zero value associated with a location and tracks relative movement from that physical location. Rotation of the motor is indexed so that return to the preset zero position is achieved by counting the number of "steps" from the zero position. Movement may be made only in the preset, two dimensional *rotational motion* provided by the motor. Three dimensional movement is provided by two cooperative stepper motors, which allow for rotation of a shaft as the two dimensional movement described earlier, coupled with the upward and downward movement of the shaft associated with a second stepper motor. Moslehi does not teach or suggest the use of a beam as a reference point, as required by the instant claims.

Mitro discloses an apparatus which again provides a shaft driven rotational motion for movement of specimen relative to a etching or coating device. The Examiner cites it for "disposing the substrate at an angle" and "uniform coating." Mitro does not, however, disclose the use of a beam as a reference point as required by the instant claims.

Baldwin is cited for the use of a beam to detect position. Baldwin, however, does not teach or suggest the use of a beam to detect *position.* Baldwin teaches the use of a beam to detect the *deposition thickness of material on the substrate. Col. 4, lines 24-31.*

Baldwin is therefore not capable of determining where a device is in three dimensional space, but merely the size of the material incident to the beam. Moreover, Baldwin is not capable of determining the angle of incidence of the beam to the detected material.

In light of the foregoing, it would not be obvious to combine Baldwin, Moslehi and Mitro to obtain the claimed invention, *nor does the combination of the three references result in a teaching or suggestion of the claimed invention*. There is no teaching, alone or in combination, of the use of a beam to detect the position of a device in three dimensional space. Nor is there a teaching of using such a beam to align such a device at an angle incident to the beam. For the reasons stated above, Applicants respectfully submit that the rejection of claims 1, 3-7, 16-21, 24-31, 58-65, 68, 69, 73-75, 118, 120, 121, 124-135, 137-151 and 158-164 is overcome, and reversal of the rejection thereof is respectfully requested along with a holding that each of the claims is allowable.

Respectfully submitted,

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RELATED PROCEEDINGS APPENDIX

There are no related appeals or interferences.

APPENDIX OF CLAIMS

1. (Rejected) An apparatus for preparing a specimen for microscopy, comprising:

a plasma generator for plasma cleaning said specimen;

means for removing material from said specimen;

means for coating said specimen with a conductive material; and

means for plasma etching said specimen which includes the selective spatial isolation of said means for plasma etching said specimen and said specimen from said plasma generator, said means for removing material and said means for coating said specimen when said means for plasma etching said specimen is operational;

wherein said plasma cleaning of said specimen and said coating of said specimen may be performed in a single process chamber under continuous vacuum conditions.

2. (Cancelled)

3. (Rejected) An apparatus according to claim 1, wherein said means for removing comprises means for etching said specimen using an ion beam.

4. (Rejected) An apparatus according to claim 3, wherein said means for etching comprises an ion source for directing said ion beam at said specimen.

5. (Rejected) An apparatus according to claim 4, wherein said means for etching further comprises a source of process gas positioned adjacent said ion source.

6. (Rejected) An apparatus according to claim 1, said means for coating comprising a magnetron sputtering device.

7. (Rejected) An apparatus according to claim 1, said means for coating comprising an ion source for directing an ion beam at a target, said target being formed of said conductive material.

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Rejected) An apparatus according to claim 1, wherein said plasma generator comprises a plasma tube, a coil wrapped around said plasma tube, and an RF power supply connected to said coil.

17. (Rejected) An apparatus according to claim 16, further comprising a source of process gas including oxygen connected to said plasma tube, said plasma cleaning being performed using said process gas.

18. (Rejected) An apparatus according to claim 17, said process gas further including argon.

19. (Rejected) An apparatus according to claim 18, said process gas comprising a mixture of 75% argon and 25% oxygen.

20. (Rejected) An apparatus according to claim 17, said process gas further including a non-reactive gas.

21. (Rejected) An apparatus according to claim 1, further comprising a vacuum pump connected to said process chamber for evacuating said process chamber to a selected vacuum level.

22. (Cancelled)

23. (Cancelled)

24. (Rejected) An apparatus according to claim 21, further comprising an oil-free vacuum pump for controlling said vacuum conditions.

25. (Rejected) An apparatus according to claim 24, said oil-free vacuum pump selected from the group consisting of oil-free diaphragm pumps, molecular drag pumps, turbomolecular drag pumps, molecular drag pumps backed by a diaphragm pump, turbomolecular drag pumps backed by a diaphragm pump, cryosorption pumps, reciprocating piston pumps, scroll pumps, screw pumps, claw pumps, non-oil sealed single and multistage piston pumps, and rotary lobe pumps.

26. (Rejected) An apparatus according to claim 1, further comprising a specimen stage for holding said specimen, said specimen stage being adapted to tilt said specimen with respect to said means for removing, said specimen stage being rotatable about an axis of rotation generally perpendicular to a plane defined by a surface of said specimen when said specimen is held by said specimen stage.

27. (Rejected) An apparatus according to claim 26, further comprising means for cooling said specimen stage.

28. (Rejected) An apparatus according to claim 26, said specimen stage being selectively moveable along said axis of rotation.

29. (Rejected) An apparatus according to claim 1, said chamber further comprising a specimen stage for holding said specimen, said specimen stage being adapted to tilt said specimen with respect to said means for removing, said specimen stage being rotatable about an axis of rotation generally perpendicular to a plane defined by a

surface of said specimen when said specimen is held by said specimen stage.

30. (Rejected) An apparatus according to claim 1, said chamber further comprising a cold trap.

31. (Rejected) An apparatus according to claim 1, said chamber further comprising a crystal oscillator for measuring an amount of said conductive material that is deposited on said specimen.

32. (Cancelled)

33. (Cancelled)

34. (Cancelled)

35. (Cancelled)

36. (Cancelled)

37. (Cancelled)

38. (Cancelled)

39. (Cancelled)

40. (Cancelled)

41. (Cancelled)

42. (Cancelled)

43. (Cancelled)

44. (Cancelled)

45. (Cancelled)

46. (Cancelled)

47. (Cancelled)

48. (Cancelled)

49. (Cancelled)

50. (Cancelled)

51. (Cancelled)

52. (Cancelled)

53. (Cancelled)

54. (Cancelled)

55. (Cancelled)

56. (Cancelled)

57. (Cancelled)

58. (Rejected) An apparatus according to claim 1, said plasma etching further comprising capacitive discharge plasma etching.

59. (Rejected) An apparatus according to claim 58, said means for plasma etching comprising a first electrode supported by said process chamber and a second electrode supported by said process chamber, said first and second electrodes defining a gap therebetween for receiving said specimen.

60. (Rejected) An apparatus according to claim 59, said first and second electrodes each comprising a substantially planar electrode, said first electrode and said

second electrode being substantially parallel to one another.

61. (Rejected) An apparatus according to claim 60, further comprising a specimen stage for holding said specimen, said specimen stage being supported by said process chamber, at least a portion of said specimen stage being said first electrode.

62. (Rejected) An apparatus according to claim 61, said specimen stage being moveable in a direction substantially perpendicular to a planar surface of said first electrode.

63. (Rejected) An apparatus according to claim 61, said second electrode being moveable in a direction substantially perpendicular to a planar surface of said second electrode.

64. (Rejected) An apparatus according to claim 59, further comprising an alternating voltage source connected to said first and second electrodes for generating an electric field within said gap, said electric field generating a plasma from a gas introduced into said gap.

65. (Rejected) An apparatus according to claim 1, said plasma etching further comprising inductively coupled plasma etching.

66. (Cancelled)

67. (Cancelled)

68. (Rejected) An apparatus according to claim 3, further comprising means for ion beam etching said specimen, wherein said ion beam etching may be performed under said continuous vacuum conditions.

69. (Rejected) An apparatus according to claim 68, further comprising an ion source for directing an ion beam at said specimen, said ion beam etching said specimen, wherein said etching of said specimen with said ion beam may be performed under continuous vacuum conditions.

70. (Cancelled)

71. (Cancelled)

72. (Cancelled)

73. (Rejected) An apparatus according to claim 69, wherein said ion source may selectively direct said ion beam at said specimen for ion beam etching said specimen under said continuous vacuum conditions.

74. (Rejected) An apparatus according to claim 73, further comprising a specimen stage for holding said specimen, said specimen stage being moveable between a first position in which said specimen is within a path of said ion beam such that said ion beam is directed at and impinges upon said specimen and a second position in which said

specimen is outside of said path such that said ion beam is directed at and impinges upon said target.

75. (Rejected) An apparatus according to claim 74, said specimen stage being adapted to tilt said specimen with respect to said ion source, said specimen stage being rotatable about an axis of rotation generally perpendicular to a plane defined by a surface at said specimen when said specimen is held by said specimen stage.

76. (Cancelled)

77. (Cancelled)

78. (Cancelled)

79. (Cancelled)

80. (Cancelled)

81. (Cancelled)

82. (Cancelled)

83. (Cancelled)

84. (Cancelled)

85. (Cancelled)

86. (Cancelled)

87. (Cancelled)

88. (Cancelled)

89. (Cancelled)

90. (Cancelled)

91. (Cancelled)

92. (Cancelled)

93. (Cancelled)

94. (Cancelled)

95. (Cancelled)

96. (Cancelled)

97. (Cancelled)

98. (Cancelled)

99. (Cancelled)

100. (Cancelled)

101. (Cancelled)

102. (Cancelled)

103. (Cancelled)

104. (Cancelled)

105. (Cancelled)

106. (Cancelled)

107. (Cancelled)

108. (Cancelled)

109. (Cancelled)

110. (Cancelled)

111. (Cancelled)

112. (Cancelled)

113. (Cancelled)

114. (Cancelled)

115. (Cancelled)

116. (Cancelled)

117. (Cancelled)

118. (Rejected) An apparatus according to claim 1, further comprising a load lock chamber connected to said process chamber.

119. (Cancelled)

120. (Rejected) An apparatus according to claim 68, said etching comprising reactive ion beam etching, said apparatus further comprising a source of reactive process gas connected to said ion source.

121. (Rejected) An apparatus according to claim 58, said plasma etching utilizing a plasma generated by capacitive discharge, said plasma etching assembly further comprising an electrode and an alternating voltage source connected to said electrode.

122. (Cancelled)

123. (Cancelled)

124. (Rejected) An apparatus according to claim 59, wherein one or more of a size of said gap and a power of said alternating voltage source are automatically controlled based on parameters set by a user.

125. (Rejected) An apparatus according to claim 124, said plasma etching assembly further comprising two or more gas inlets, said process gas comprising a mixture of two or more process gasses selected by a user.

126. (Rejected) An apparatus according to claim 125, wherein said process gasses further comprise at least one of O_2, CF_4 and CHF_3.

127. (Rejected) An apparatus according to claim 1, said means for plasma etching further comprising two or more gas inlets, said plasma etching of said specimen utilizing a plasma generated from a mixture of two or more process gasses selected by a user.

128. (Rejected) An apparatus according to claim 1, said means for plasma etching being usable to plasma clean said specimen by generating a plasma from a process gas including oxygen.

129. (Rejected) An apparatus according to claim 1, wherein coating comprises ion beam sputter coating, said means for coating comprising a target formed of said

conductive material, said ion source directing said ion beam at said target.

130. (Rejected) An apparatus according to claim 129, said means for coating further comprising a lever supported by said vacuum chamber, said lever holding said target, said lever being selectively moveable into a position in which said ion beam is directed at said target.

131. (Rejected) An apparatus according to claim 1, said means for coating comprising a plurality of targets, each of said targets being formed of a conductive material, said ion source directing said ion beam at a selected one of said targets.

132. (Rejected) An apparatus according to claim 131, said means for coating further comprising means for moving said selected one of said targets from a covered position to an exposed position.

133. (Rejected) An apparatus according to claim 131, said means for coating further comprising a lever supported by said vacuum chamber, said lever holding said plurality of targets, said lever being selectively moveable into a position in which said ion beam is directed at said selected one of said targets.

134. (Rejected) An apparatus according to claim 133, said plurality of targets being held by a target holder, said target holder being moveable among a plurality of positions, each of said positions exposing one of said targets and covering a remaining

one or more of said targets.

135. (Rejected) An apparatus according to claim 134, said target holder being rotatably supported by said lever, said target holder being rotatable among said plurality of positions.

136. (Objected To) An apparatus according to claim 135, said target holder further comprising a plurality of pins, said vacuum chamber supporting an arm, said target holder being selectively rotated by contact between said arm and any one of said pins.

137. (Rejected) An apparatus according to claim 133, further comprising means for selectively exposing said selected one of said targets and covering a remaining one or more of said targets.

138. (Cancelled)

139. (Rejected) An apparatus according to claim 1, further comprising a sample stage being moveable to a plurality of processing positions inside said vacuum chamber under said continuous vacuum conditions for performing said removing, said plasma cleaning, said plasma etching and said coating of said specimen.

140. (Rejected) An apparatus according to claim 139, said sample stage being automatically moveable among said processing positions based on parameters set by a user.

141. (Rejected) An apparatus according to claim 140, said parameters including an order of movement among selected ones of said processing positions.

142. (Rejected) An apparatus according to claim 139, said sample stage being moveable in a first direction along a vertical axis of said vacuum chamber, said apparatus further comprising means for detecting a first position of a surface of said specimen along said vertical axis, wherein said sample stage is moved automatically to said plurality of processing positions based on said first position.

143. (Rejected) An apparatus according to claim 142, wherein said first position is measured relative to a second position along said vertical axis.

144. (Rejected) An apparatus according to claim 139, said sample stage being moveable in a first direction along a vertical axis of said vacuum chamber, said apparatus further comprising a beam generating device and a beam sensor supported by said vacuum chamber, said beam generating device and said beam sensor being used to detect a first position of a surface of said specimen along said vertical axis, wherein said sample stage is moved automatically to said plurality of processing positions based on said first

position.

145. (Rejected) An apparatus according to claim 144, wherein said first position is measured relative to a second portion along said vertical axis.

146. (Rejected) An apparatus according to claim 144, said beam generating device comprising a laser.

147. (Rejected)) An apparatus according to claim 139, said sample stage being moveable in a first direction along a vertical axis of said vacuum chamber, at least a first portion of said sample stage that supports said specimen being rotatable about said vertical axis, and at least a second portion of said sample stage connected to said first portion being moveable in a first angular direction with respect to said vertical axis.

148. (Rejected) An apparatus according to claim 147, at least a third portion of said sample stage connected to said second portion being moveable in a second angular direction with respect to said vertical axis.

149. (Rejected) An apparatus according to claim 139, said sample stage having at least three degrees of selective independent movement.

150. (Rejected) An apparatus according to claim 149, sample stage having at least four degrees of selective independent movement.

151. (Rejected)) An apparatus according to claim 1, said process chamber having a first aperture adjacent said plasma generator, a first moveable shutter for selectively covering said first aperture, a second aperture adjacent said means for plasma etching, and a second moveable shutter for selectively covering said second aperture.

152. (Withdrawn) A method for preparing a specimen for microscopy, comprising:

determining a first position of a surface of said specimen along an axis of a processing chamber;

automatically moving said specimen to one or more processing locations within said processing chamber based on said first position.

153. (Withdrawn) A method according to claim 152, said determining step further comprising determining said first position relative to a second position along said axis.

154. (Withdrawn) A method according to claim 152, said determining step further comprising:

generating a beam;

directing said beam at a sensor;

moving said specimen along said axis;

establishing said first position when a predetermined level is measured by said sensor.

155. (Withdrawn) A method according to claim 154, said beam comprising a laser beam.

156. (Withdrawn) A method according to claim 154, said predetermined level comprising approximately 50% of a level measured when said sensor is completely unobscured.

157. (Withdrawn) A method according to claim 156, said determining step further comprising:

(a) moving said specimen along said axis to an obscuring position in which said sensor is completely obscured and setting a blocked position variable equal to said obscuring position;

(b) moving said specimen along said axis to an unobscuring position in which said sensor is completely unobscured, obtaining an unobscured sensor level reading, and setting a clear position variable equal to said unobscuring position;

(c) moving said specimen to a midpoint position that is approximately halfway between a position equal to said blocked position variable and a position equal to said clear position variable;

(d) obtaining a current sensor level reading at said midpoint position;

(e) determining whether said current sensor level reading is equal to approximately 50% of said unobscured sensor level reading;

(f) setting said first position equal to said midpoint position if said current sensor level reading is equal to approximately 50% of said unobscured sensor level reading;

(g) setting said blocked position variable equal to said midpoint position if said current sensor level reading is less than approximately 50% of said unobscured sensor level reading and repeating steps (c) through (h) until said first position is set in step (f); and

(h) setting said clear position variable equal to said midpoint position if said current sensor level reading is greater than approximately 50% of said unobscured sensor level reading and repeating steps (c) through (h) until said first position is set in step (f).

158. (Rejected) An apparatus for preparing a specimen for microscopy, comprising:

a processing chamber;

a sample stage, said sample stage being moveable to one or more processing positions inside said processing chamber, said processing position being defined by three dimensional coordinates; and

means for detecting a first position of a surface of said specimen within said processing chamber;

wherein said sample stage is moved automatically to said one or more

processing positions remote from said first position in any of three dimensions and at an angle relative to a beam impinging thereon.

159. (Rejected) An apparatus according to claim 158, wherein said first position is measured relative to a second position along said axis.

160. (Rejected) An apparatus according to claim 158, said processing positions including positions for performing one or more of etching said specimen, plasma cleaning said specimen, plasma etching said specimen and coating said specimen with a conductive material.

161. (Rejected) An apparatus for preparing a specimen for microscopy, comprising:

a processing chamber;

a sample stage, said sample stage being moveable to one or more processing positions inside said processing chamber, said processing positions being defined by three dimensional coordinates; and

a beam generating device and a beam sensor supported by said processing chamber, said beam generating device and said beam sensor being used to detect a first position of a surface of said specimen within said processing chamber;

wherein said sample stage is moved automatically to said one or more processing positions remote from said first position in any of three dimensions and at an

angle relative to said beam generating device.

162. (Rejected) An apparatus according to claim 161, wherein said first position is measured relative to a second position along said axis.

163. (Rejected) An apparatus according to claim 161, said processing positions including positions for performing one or more of etching said specimen, plasma cleaning said specimen, plasma etching said specimen and coating said specimen with a conductive material.

164. (Rejected) An apparatus according to claim 161, said beam generating device comprising a laser.